No. 654,363. Patented July 24, 1900.

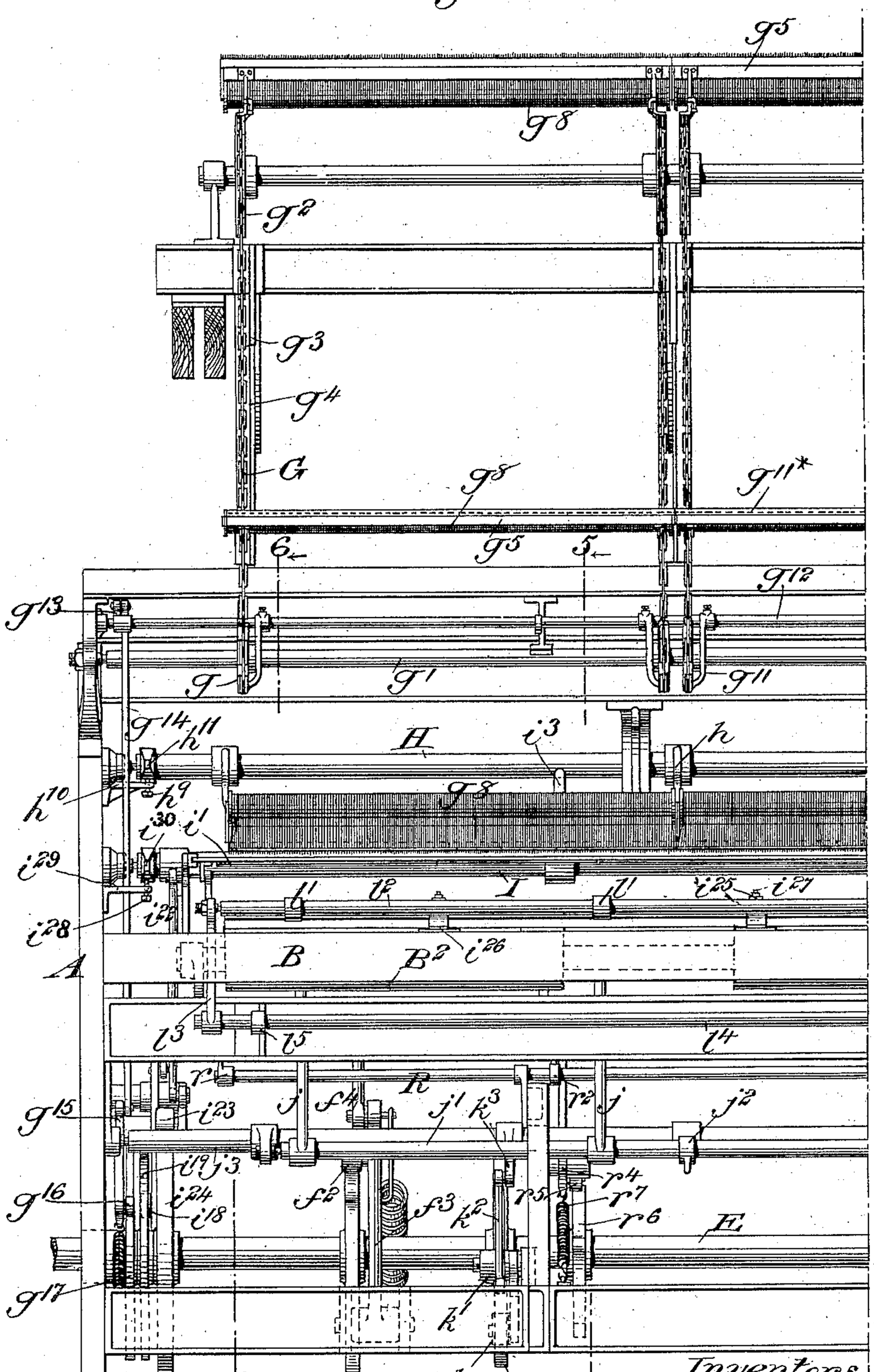
H. SKINNER & F. H. CONNOLLY.

LOOM FOR WEAVING TUFTED PILE FABRICS.

(Application filed Oct. 4, 1898.)

(No Model.) 10 Sheets—Sheet 1.

Fig. 1.



Witnesses: 6
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Edward Vieser.

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by attorneys Dominick & Dominick

No. 654,363. Patented July 24, 1900.

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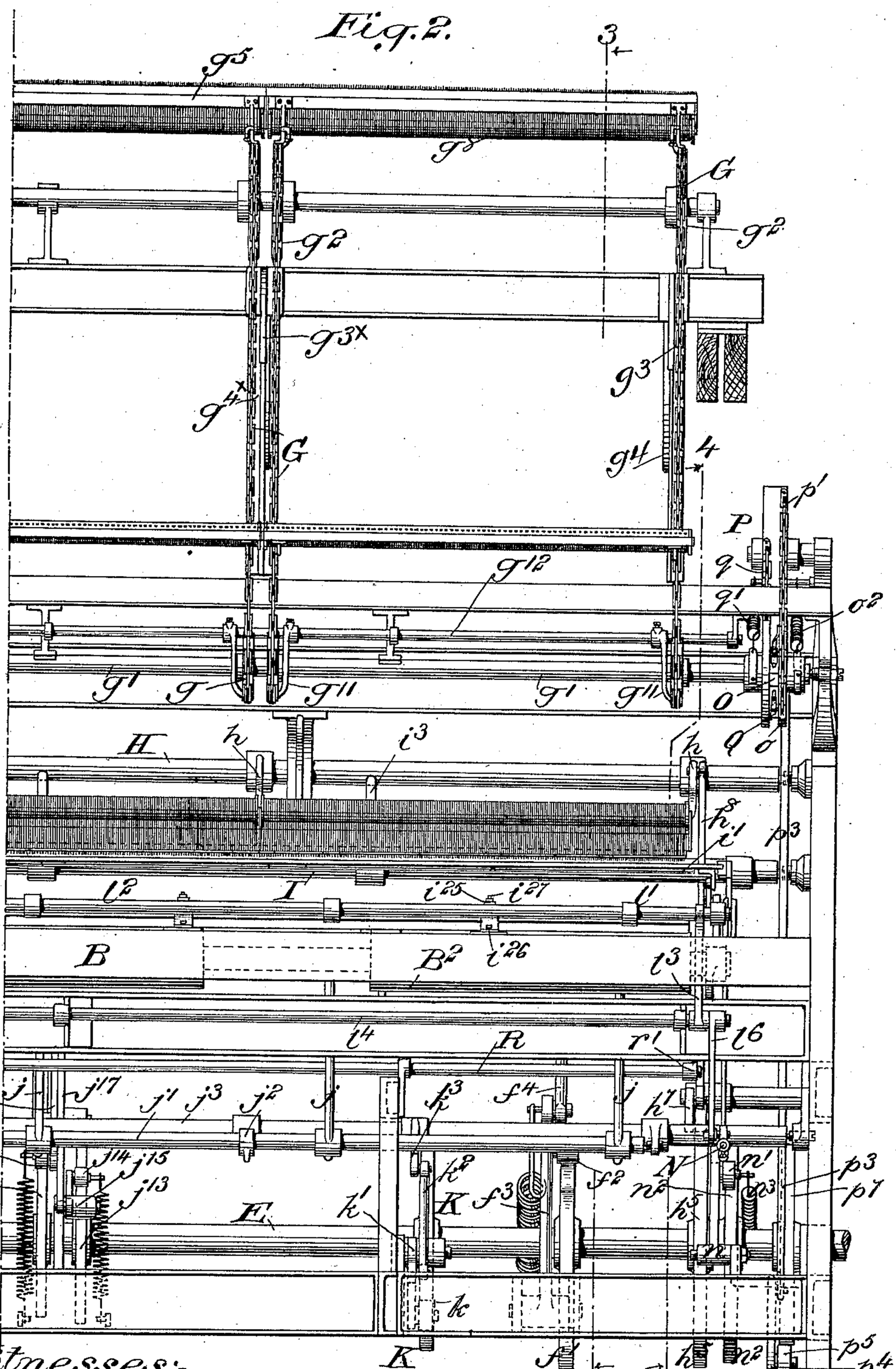
10 Sheets—Sheet 2.

Fig. 2.



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LOOM FOR WEAVING TUFTED PILE FABRICS.

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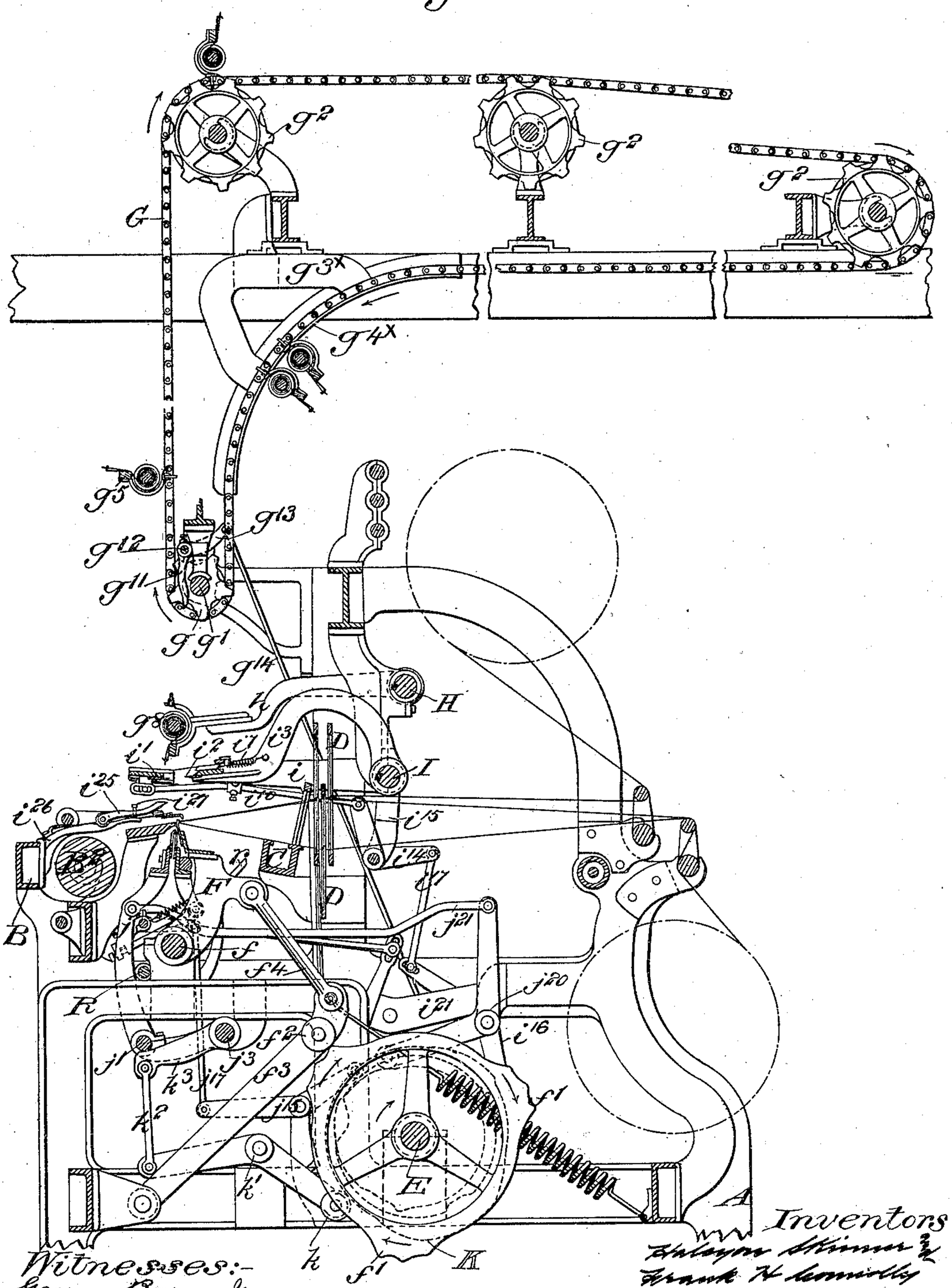
(No Model.) 10 Sheets—Sheet 3.

Fig. 3.



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LOOM FOR WEAVING TUFTED PILE FABRICS.

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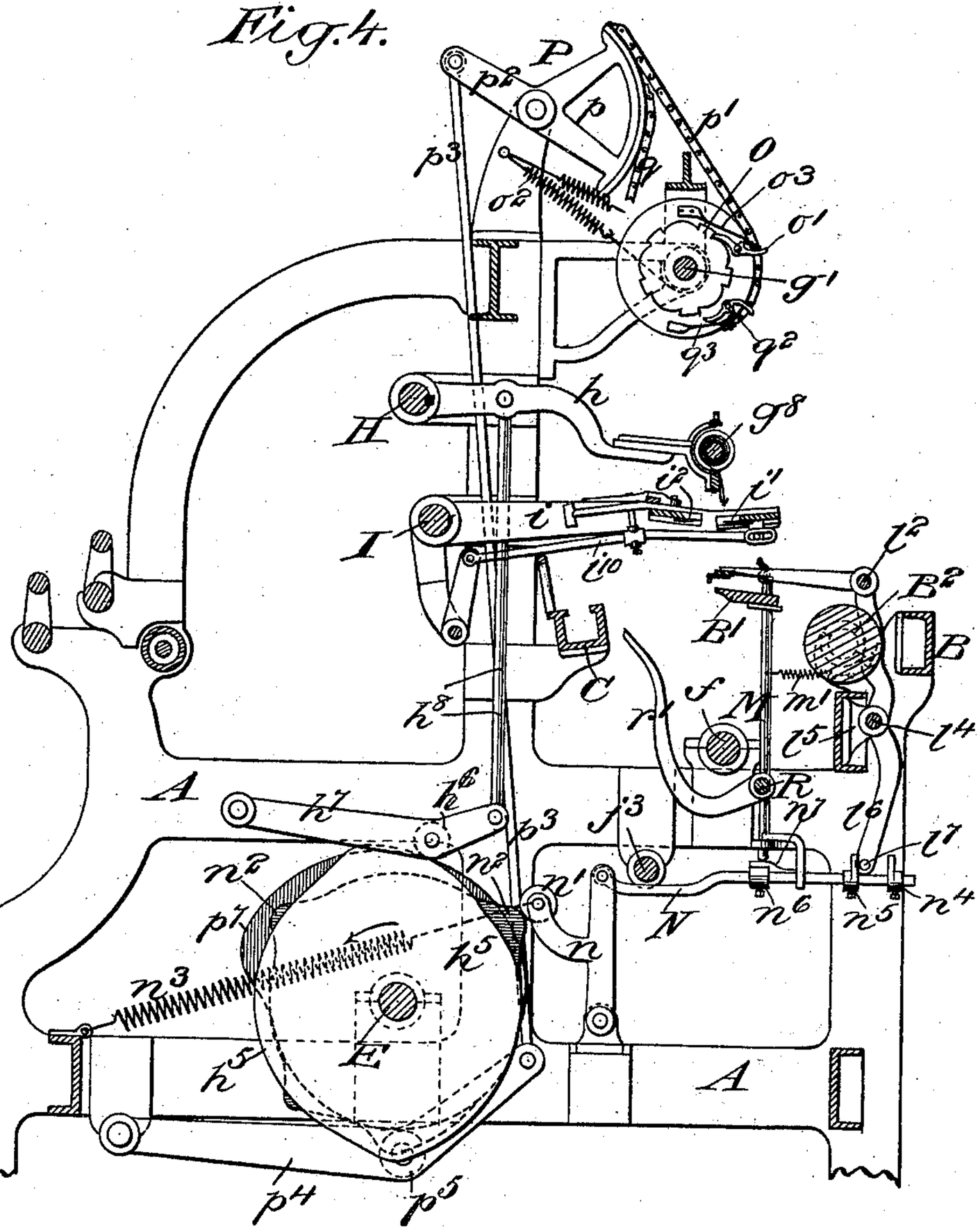
(No Model.) 10 Sheets—Sheet 4.

Fig. 4.



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LOOM FOR WEAVING TUFTED PILE FABRICS.

(No Model.) (Application filed Oct. 4, 1898.)

10 Sheets—Sheet 5.

Fig. 5.

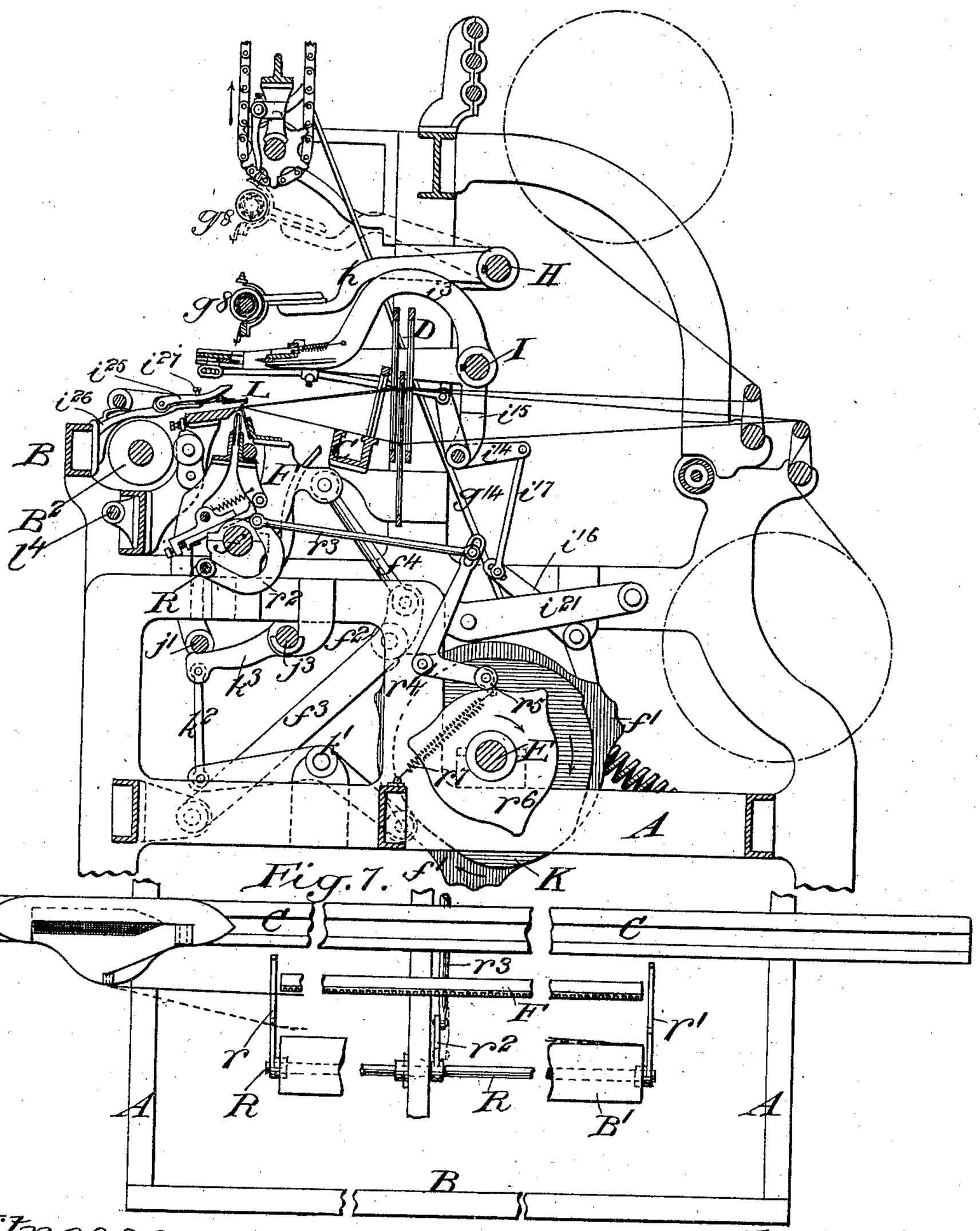

Fig. 7.

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LOOM FOR WEAVING TUFTED PILE FABRICS

(Application filed Oct. 4, 1898.)

(No Model.) 10 Sheets—Sheet 6.

Fig. 6.

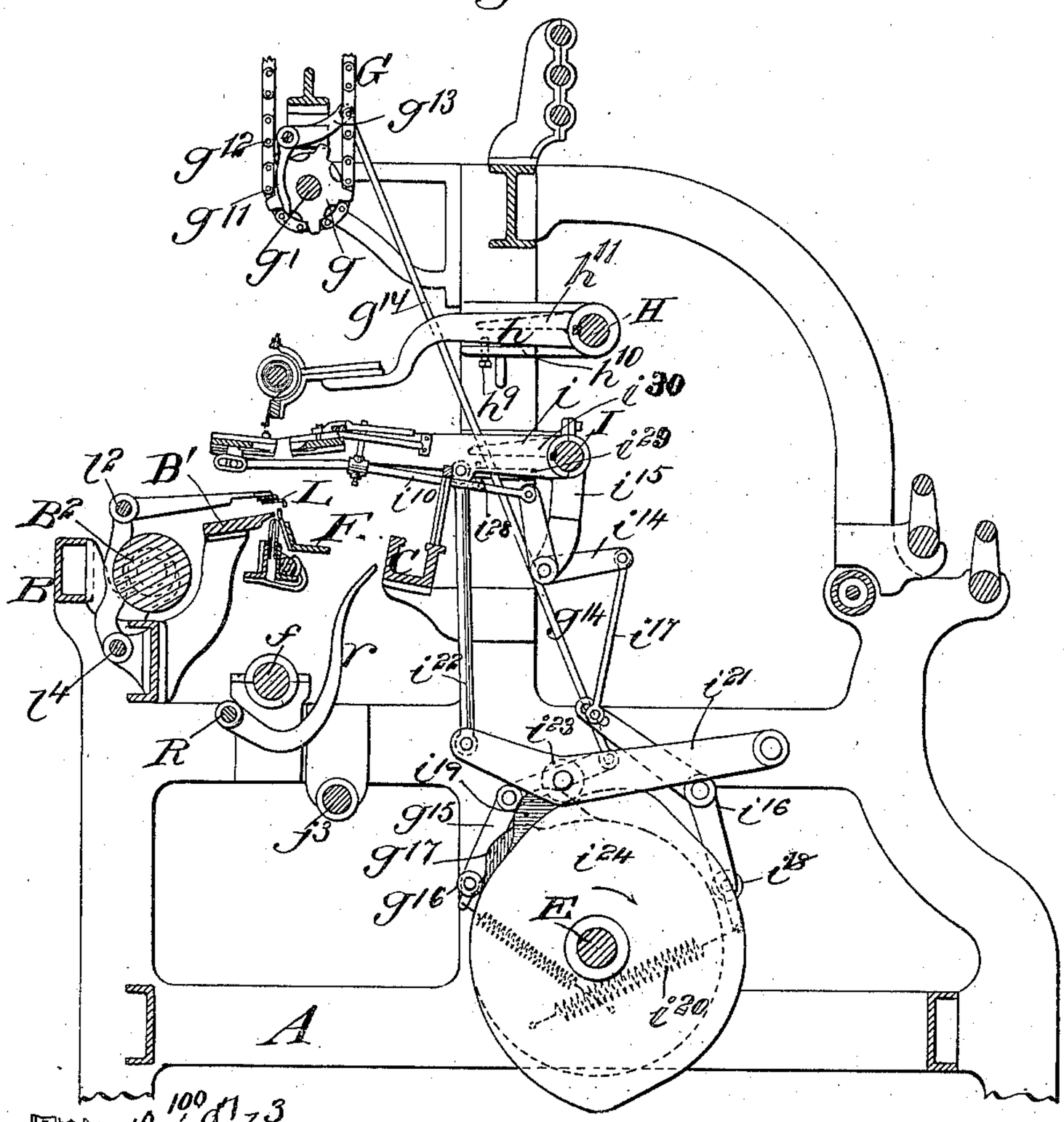

Fig. 8.

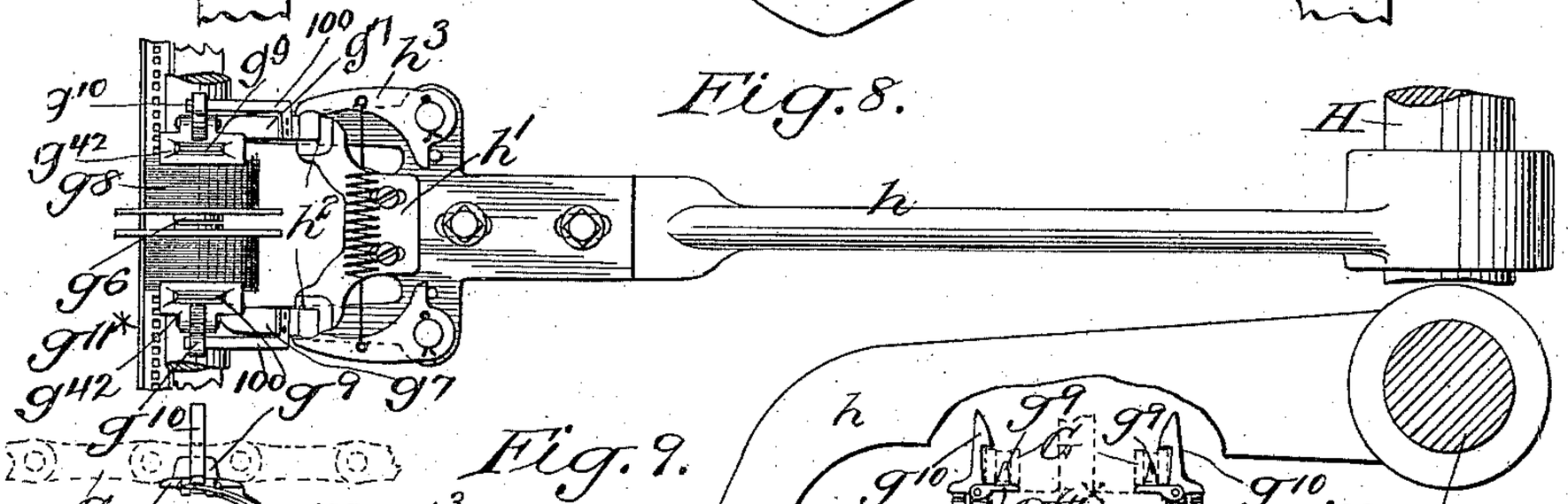

Fig. 9.

Fig. 10.

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LOOM FOR WEAVING TUFTED PILE FABRICS.

(No Model.)

(Application filed Oct. 4, 1898.)

10 Sheets—Sheet 7.

Fig. 11.

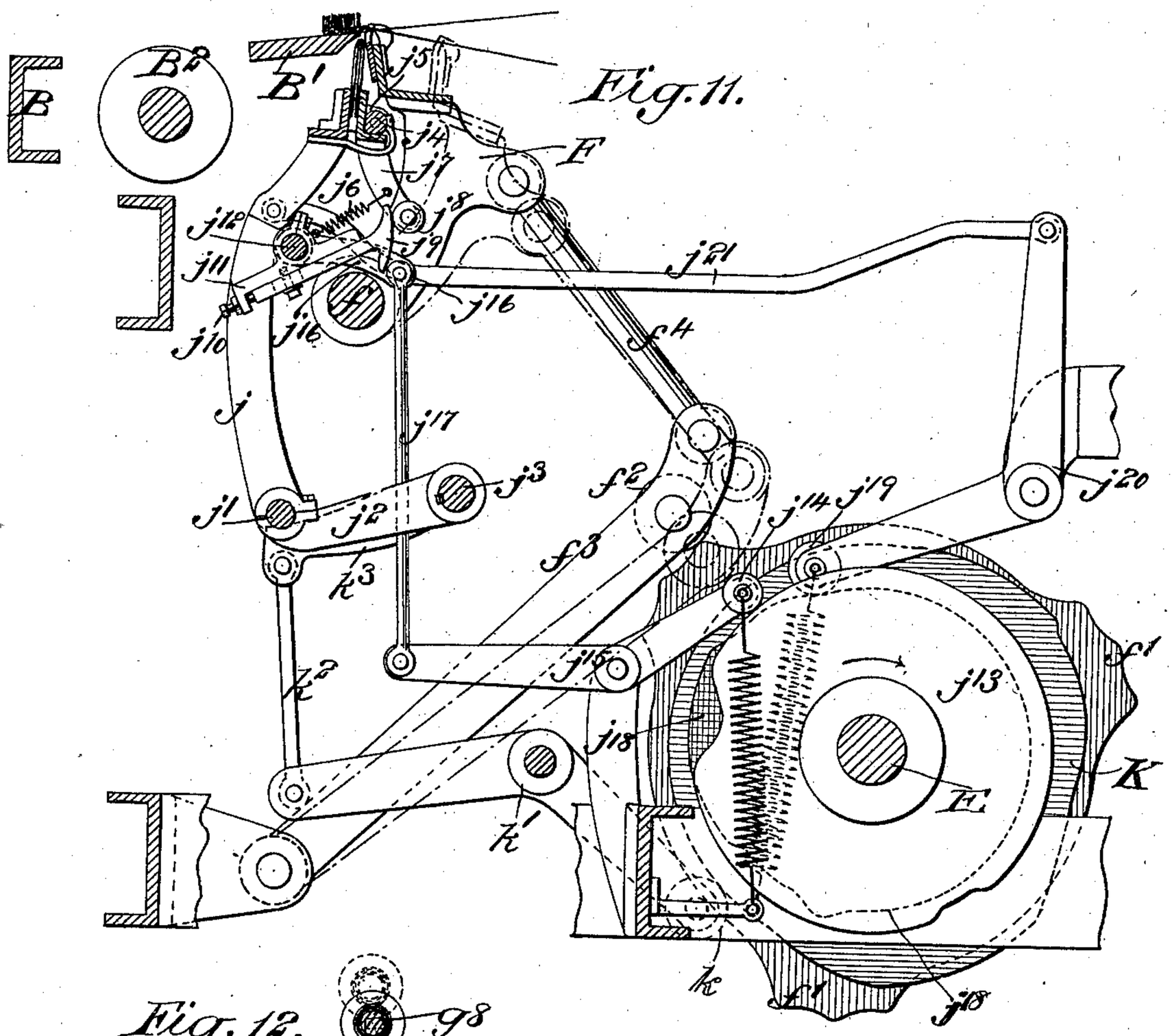


Fig. 12.

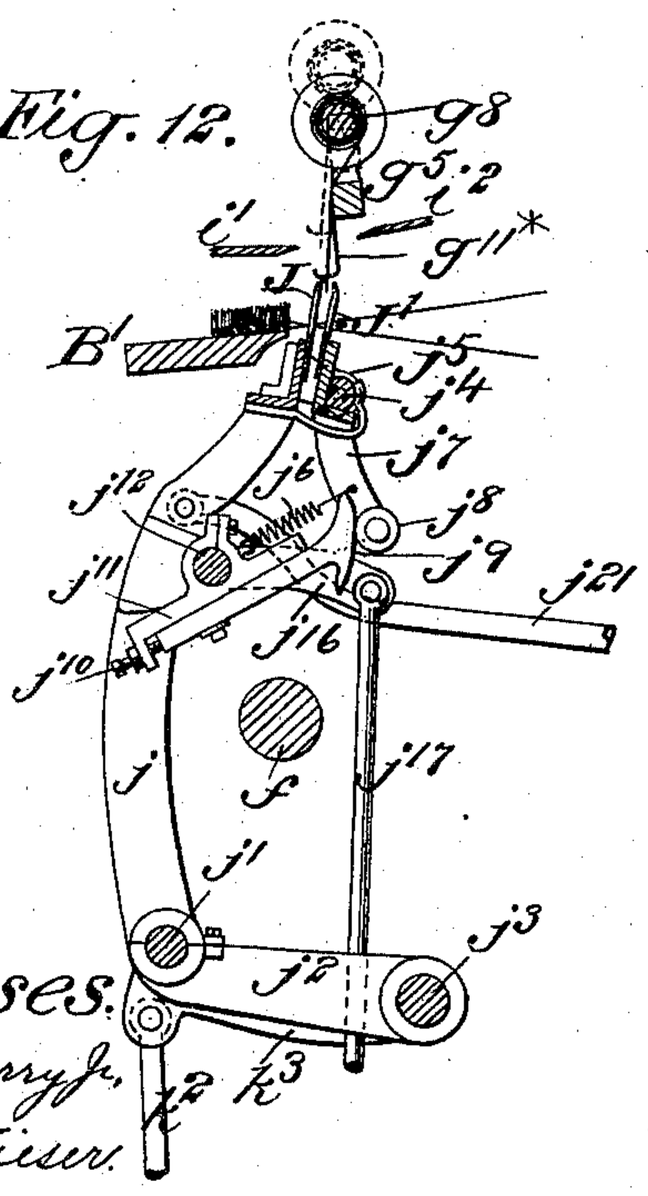


Fig. 13.

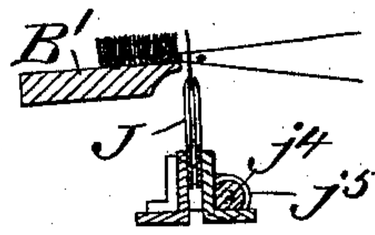


Fig. 14.

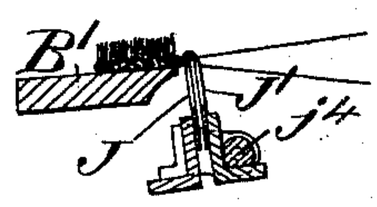
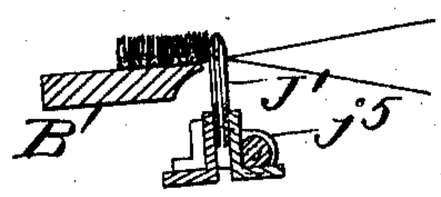


Fig. 15.



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No. 654,363. Patented July 24, 1900.

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LOOM FOR WEAVING TUFTED PILE FABRICS.

(Application filed Oct. 4, 1898.)

(No Model.) 10 Sheets—Sheet 8.

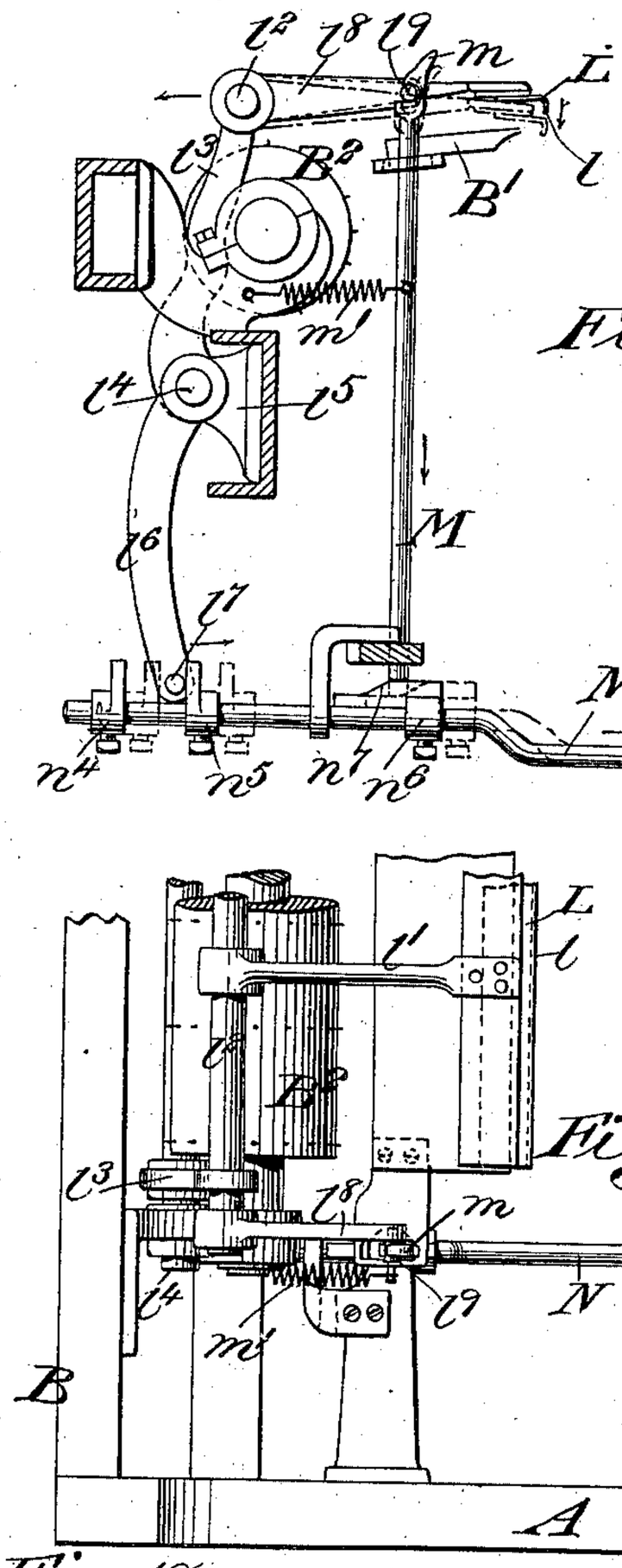

Fig. 16.

Fig. 17.

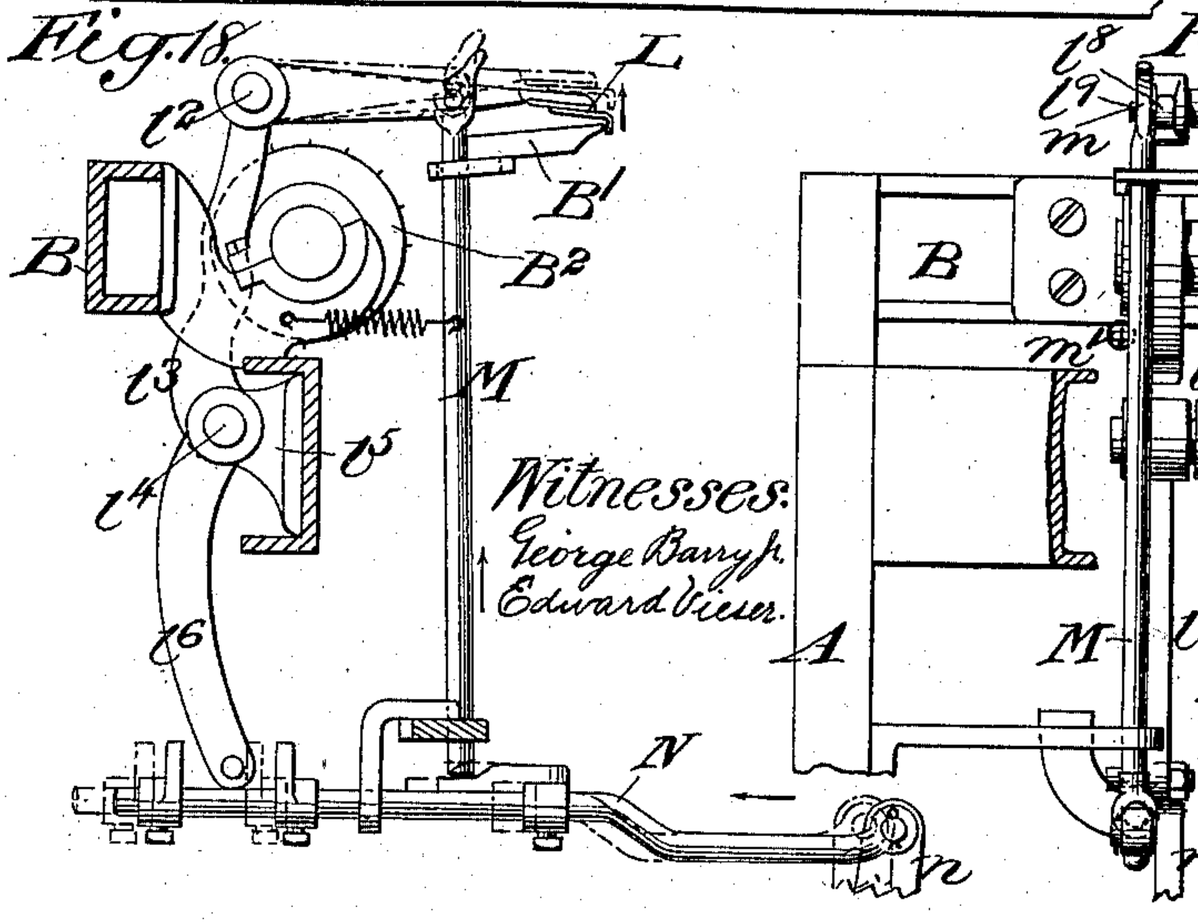

Fig. 18.

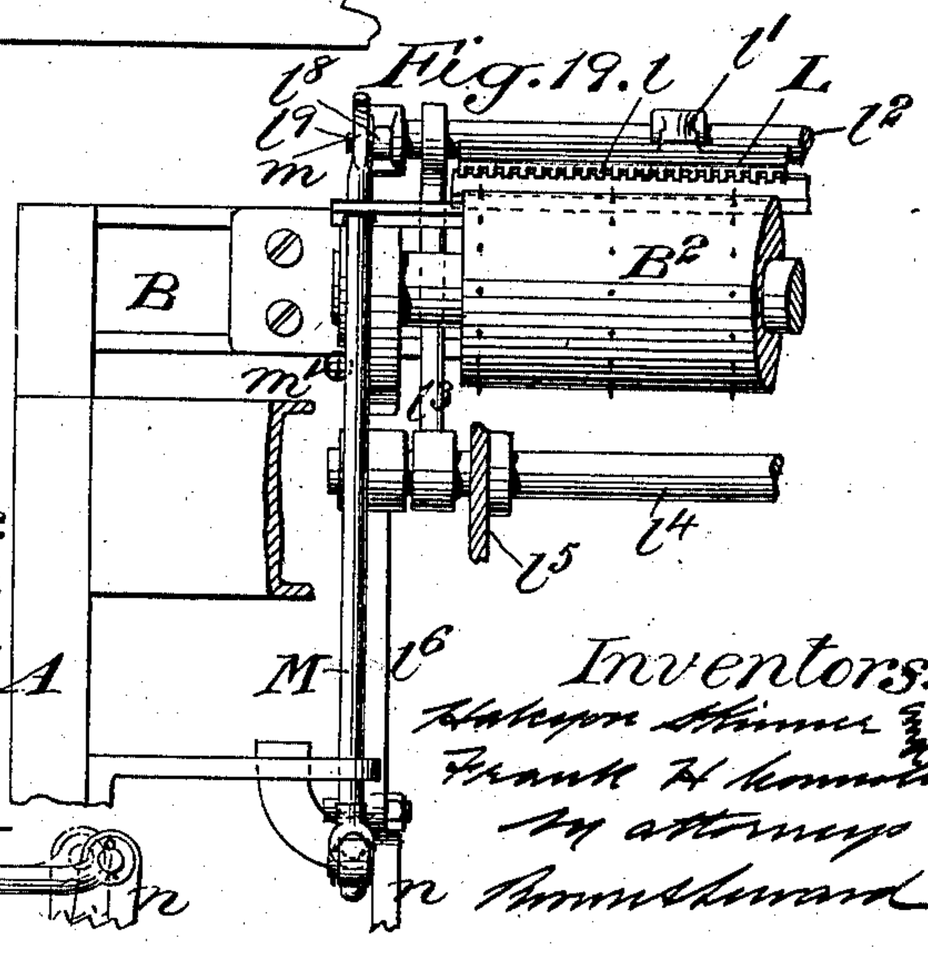

Fig. 19.

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No. 654,363. Patented July 24. 1900.

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LOOM FOR WEAVING TUFTED PILE FABRICS.

(No Model.) (Application filed Oct. 4, 1898.)

10 Sheets—Sheet 9.

Fig. 20.

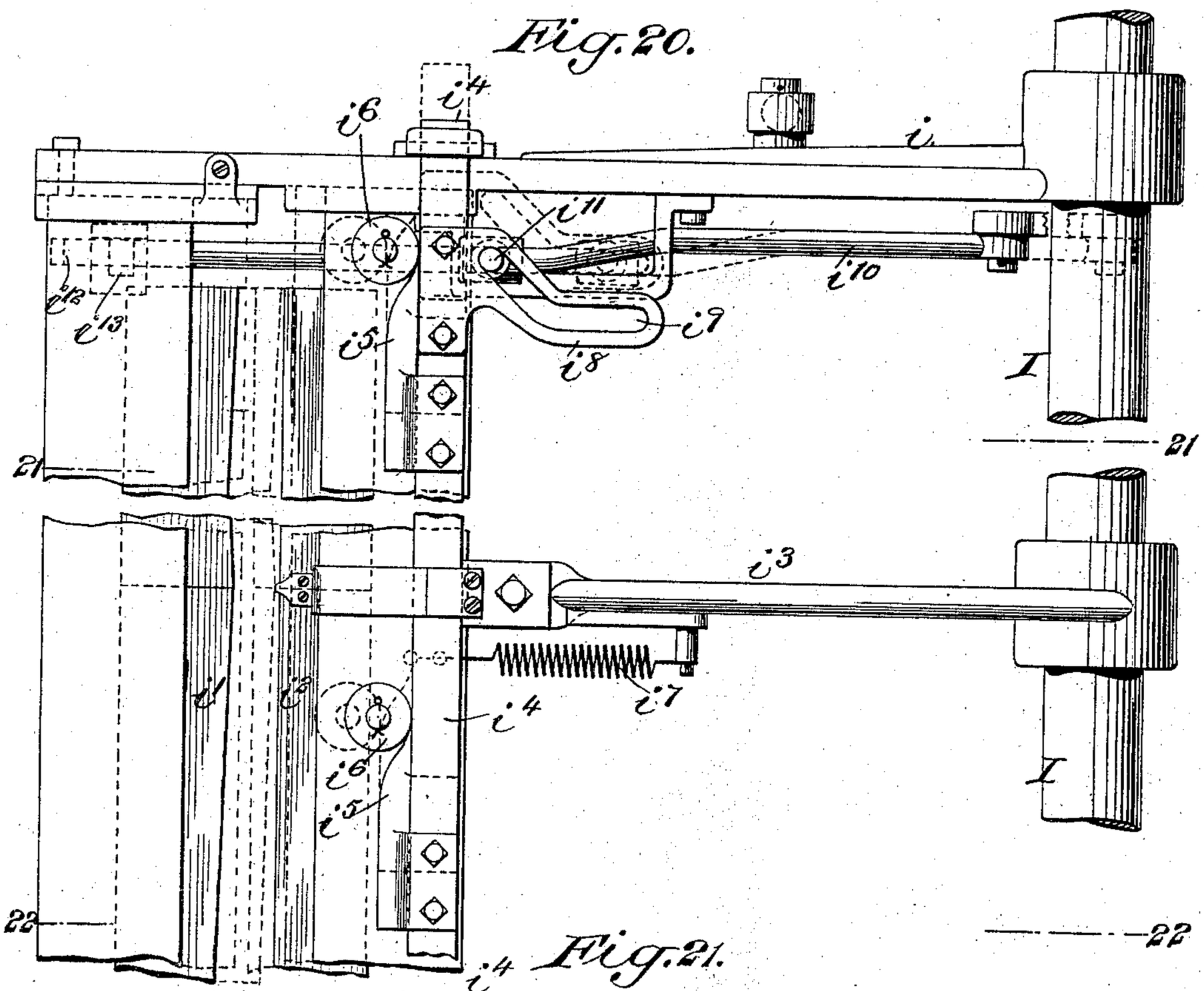


Fig. 21.

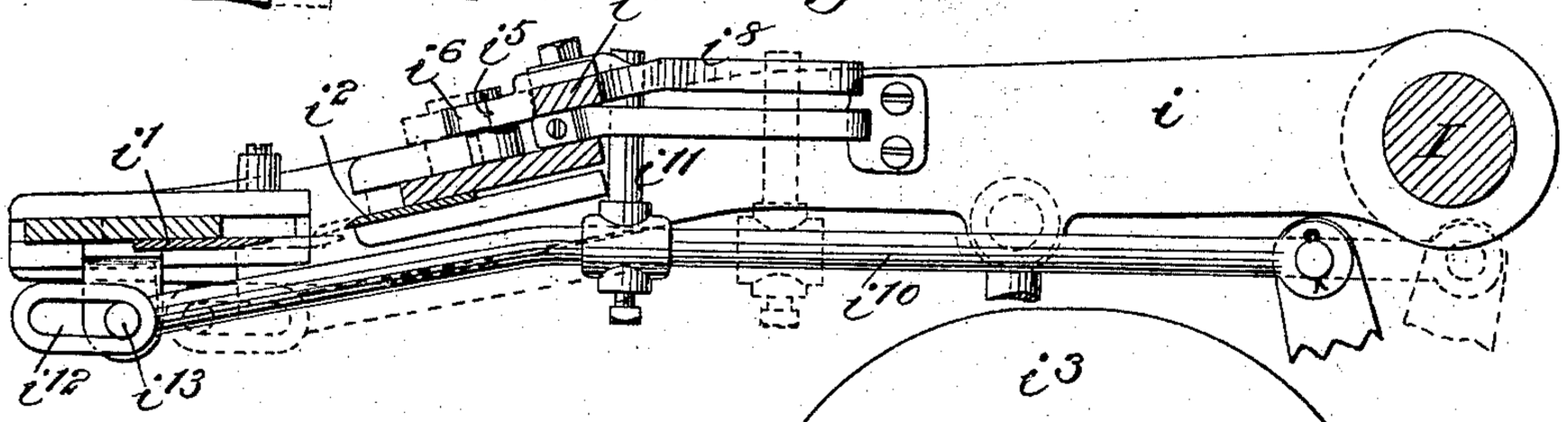
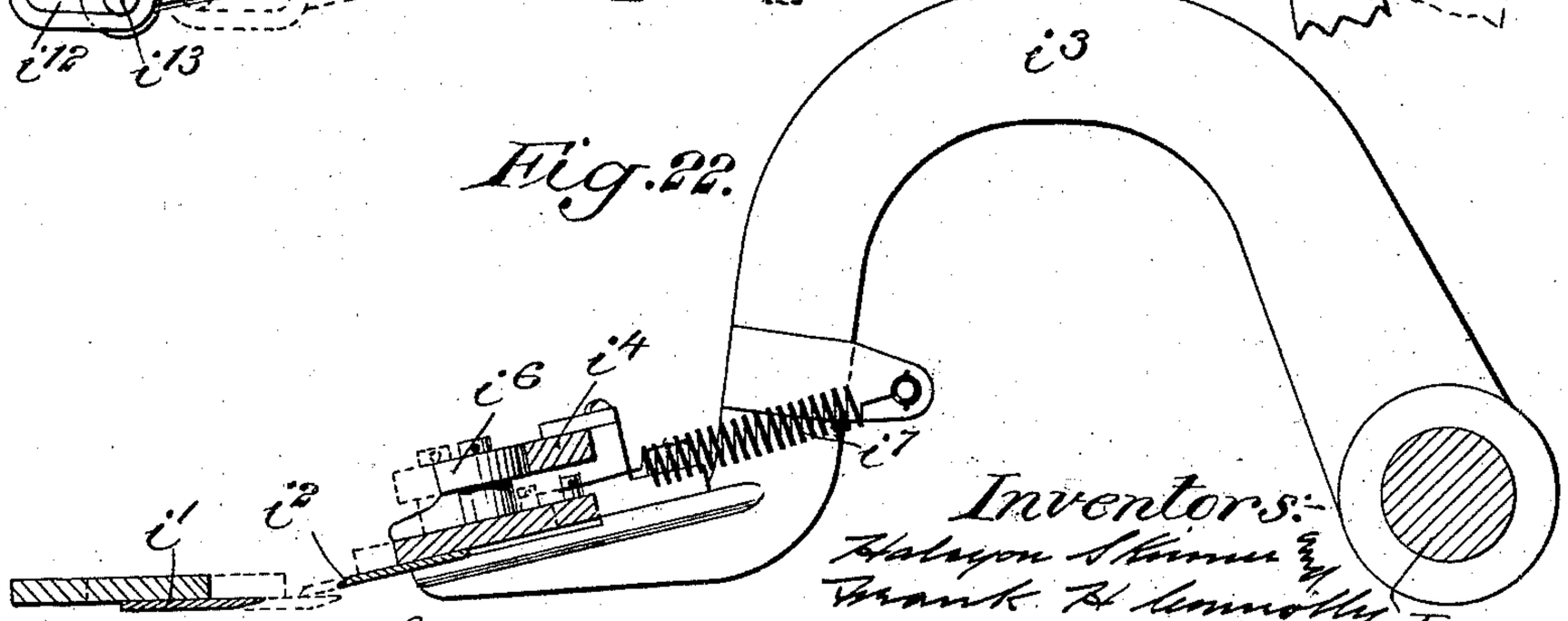


Fig. 22.



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No. 654,363. Patented July 24, 1900.

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LOOM FOR WEAVING TUFTED PILE FABRICS.

(Application filed Oct. 4, 1898.)

(No Model.) 10 Sheets—Sheet 10.

Fig. 23.

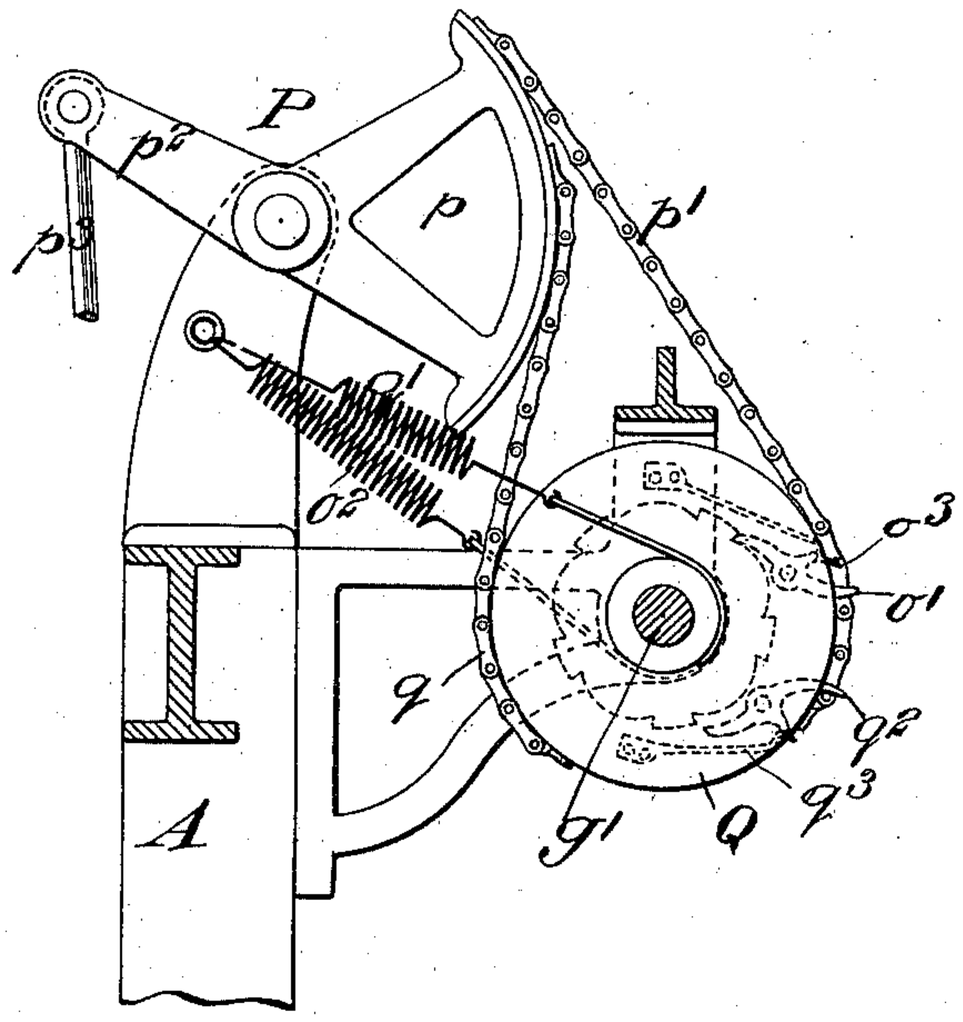


Fig. 24.

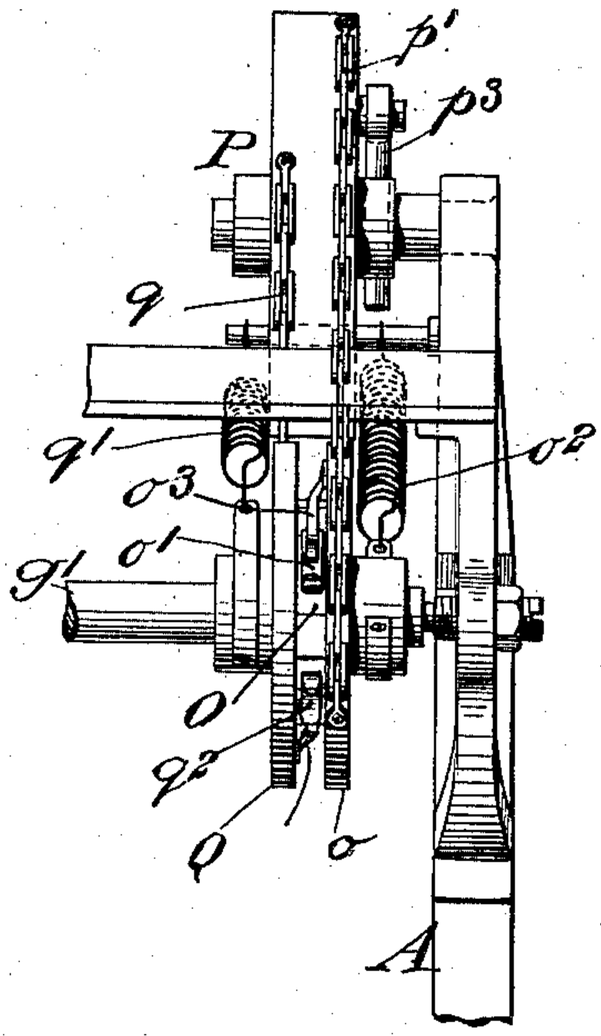
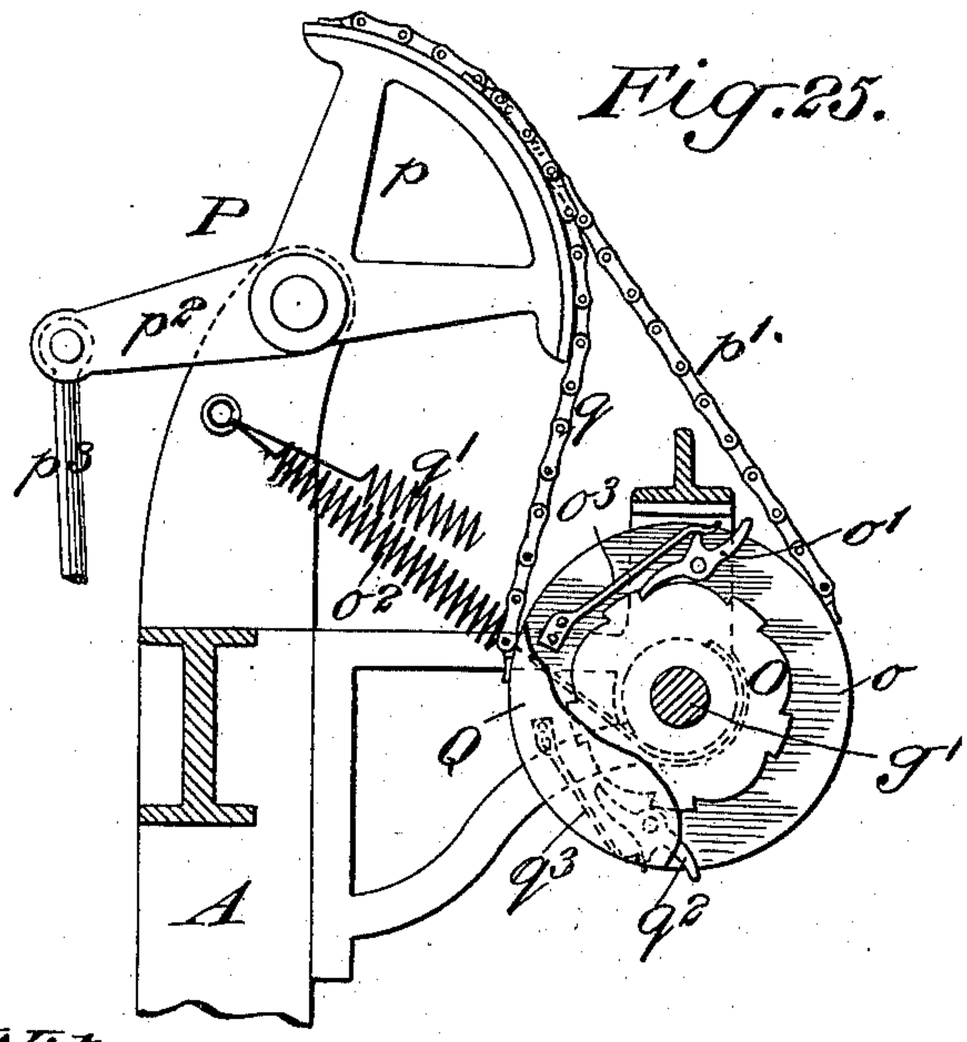


Fig. 25.



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UNITED STATES PATENT OFFICE.

HALCYON SKINNER AND FRANK H. CONNOLLY, OF YONKERS, NEW YORK.

LOOM FOR WEAVING TUFTED PILE FABRICS.

SPECIFICATION forming part of Letters Patent No. 654,363, dated July 24, 1900.

Application filed October 4, 1898. Serial No. 692,597. (No model.)

To all whom it may concern:

Be it known that we, HALCYON SKINNER and FRANK H. CONNOLLY, citizens of the United States, and residents of Yonkers, in the county of Westchester and State of New York, have invented new and useful Improvements in Looms for Weaving Tufted Pile Fabrics, of which the following is a specification.

This invention relates to improvements in looms for weaving tufted pile fabrics, and more particularly to looms for weaving "moquette" carpets whereby the weaving of fabrics of considerably greater width than has hitherto been feasible is accomplished.

A practical embodiment of our invention is represented in the accompanying drawings, in which—

Figure 1 is a front view of the left half of the loom. Fig. 2 is a front view of the right half of the loom. Fig. 3 is a vertical section from front to rear in the plane of the line 3 3 of Fig. 2. Fig. 4 is a partial vertical section from front to rear in the plane of the line 4 4 of Fig. 2. Fig. 5 is a partial vertical section from front to rear in the plane of the line 5 5 of Fig. 1. Fig. 6 is a partial vertical section from front to rear in the plane of the line 6 6 of Fig. 1. Fig. 7 is a partial top plan view showing the shuttle and the means for drawing the weft-thread up into proximity to the fell in position to be engaged by the lay-beam. Fig. 8 is a top plan view of one of the spool-carrying arms, showing the ends of two adjacent spools in position therein. Fig. 9 is a side view of the same. Fig. 10 is a front view. Fig. 11 is an enlarged detail view for showing more clearly the parts which operate the nippers. Fig. 12 is a view of a portion of the parts shown in Fig. 11, showing the nippers in their raised position about to grasp the tufts. Figs. 13, 14, and 15 represent detail views of the jaws of the nippers in different positions which they assume. Fig. 16 is an enlarged detail section representing the comb and its operating parts, the comb being represented in its forward upper position in full lines and in its forward downward position in dotted lines. Fig. 17 is a top plan view of a portion of the same. Fig. 18 is a detail vertical section of the comb and a portion of its operating mechanism, the comb being shown in full lines in its backward and downward position and in dotted lines in its backward and upward position. Fig. 19 is a partial front view of the same. Fig. 20 is an enlarged detail top plan view of a portion of the tuft-severing shears and a portion of their operating mechanism, the shears being shown in their open position in full lines and in their closed position in dotted lines. Fig. 21 is a vertical section in the plane of the line 21 21 of Fig. 20. Fig. 22 is a section in the plane of the line 22 22 of Fig. 20. Fig. 23 is an enlarged detail side view of the chain-reversing mechanism. Fig. 24 is a front view of the same; and Fig. 25 is a view similar to Fig. 23 with a portion of the controlling-disk nearest the observer broken away, the parts being shown in the reverse position to that shown in Fig. 23.

A designates the main frame of the loom; B, the breast-beam; B′, the web-supporting plate, and B^2 the take-up roller.

C designates the stationary shuttle-race, and D a set of heddles. The mechanism for operating the heddles and shuttles has not been shown in the accompanying drawings, as it is believed that it would unduly complicate the same.

E designates the main drive-shaft, which is mounted in suitable bearings and extends transversely across the loom at a point near its base.

F designates the lay-beam, which is mounted to rock back and forth on a cross-shaft *f*, which lay-beam is operated by two operating mechanisms, each of which consists of a cam *f′* on the drive-shaft E, which cam engages a roller f^2, carried by a rocking arm f^3, connected to the lay-beam by a short rod f^4. The cam *f′* is so constructed that it will impart to the lay-beam F three forward-and-backward movements during one revolution of the drive-shaft E.

The chains G, constituting spool-frame-carrying means, are arranged in pairs. In the present instance we have represented three pairs of chains located side by side. These chains G are endless and are driven by sprocket-wheels *g*, mounted on a cross-shaft *g′*, carried by the loom. A plurality of idler-sprockets g^2 are located in any suitable position above the loom-frame that the chain

may be run horizontally back and forth for any desired distance, the number of idler-sprockets varying according to the length of the chain. Guides g^3, presenting each a horizontal flange g^4, supporting the outermost chains G of the outermost pairs of chains in the lower run of the chains and their guides $g^{3\times}$, having opposite flanges $g^{4\times}$, are located at a point where a chain of one pair of chains runs close to the chain of another pair of chains, the flanges $g^{4\times}$ of the guides $g^{3\times}$ supporting the chains at intermediate points. These flanges receive upon them in the lower run of the chain substantially right-angular lips g^{42}, extending from arms g^7, connected with the spool-frames g^5. Points or projections g^9, extended from these lips substantially at right angles, enter spaces between the links of the chains. The flanges g^4 and $g^{4\times}$ support the frames and constitute a track over which they are free to be slid by the chains in the lower run of the chains near the positively-actuated shaft g'. These guides g^3 permit the use of a very long spool-carrying chain without taking up too much room. If it were not for the use of these guides, the chain would have to be fed directly from one of the idler-sprockets g^2 to the drive-sprocket g, as the position of the adjacent ends of the spool-carrying frames is such as to preclude the use of sprockets engaging the outer sides of the said chains. Each pair of chains contains a series of spool-frames having each a spool, and each pair of chains has a like number of spool-frames, and the chains are so applied to their actuating means, represented as shafts and sprocket-wheels, and so timed in their movement that the separate spool-frames of each pair of chains are in alinement with the spool-frames of the other pairs of chains, said alined spool-frames constituting a row of spool-frames parallel with the fabric being woven. In the present instance three spool-holding frames are located in each row and the rows are spaced apart a distance equal to the length of the step-by-step movement of the chains G. Each of the spool-holding frames consists of a cross-bar g^5, having a pair of upwardly-extended end bearings g^6 and a pair of curved arms g^7, located near the ends of the bar. The arms g^7 are extended from one edge of the spool-frame, and they cross the axis of rotation of each spool at a point between the headed ends of the spools. The arms g^7 correspond in number with the chains G. The end bearings g^6 are adapted to support the spindles of the spools g^8, so that several spools—in the present instance three—are supported with their axes in alinement with each other, thereby doing away with the necessity of using a very long single spool and frame or a long frame with a plurality of spools, which in either case requires the employment of means to prevent the sagging of the axis of rotation of the alined spools which destroys the proper alinement of the tuft-threads. The arms g^7 are curved that they may embrace the spools, and their upper ends are represented as terminating (see Fig. 9) substantially above the axes of the spools, and the extremity of each arm has a horizontally-extended lip g^{42}, provided with a prong g^9, adapted to enter a space in the open links of the chains G. The lips g^{42} (see Fig. 10) overlap and ride on horizontal flanges $g^{4\times}$ of the guide $g^{3\times}$, so that whenever a spool-frame is traveling in the lower run of the chain, as in Fig. 3, said lips rest on said flange and the frames are supported by the flanges, the chain resting on the lips and in their movement by the chain-actuating devices sliding the lips over the flanges of the guides.

The guide shown in Fig. 10 is a double one, it being located between chains of two pairs of chains; but the guide g^3 shown in Fig. 3, it being located at the inner side of the loom-frame, has but one flange g^4, as it supports but one chain of a pair.

Each arm g^7 has pivoted upon it a suitable latch or pawl g^{10}, which is acted upon by a suitable spring $g^{10\times}$. These pawls hook over the links of the chains entered by the projections g^9 and connect the spool-frames with the chains to be moved thereby, said latches being turned aside and released from their engagement with the chains whenever a spool-frame is to be removed from a pair of chains.

A thread-guide g^{11*} is secured to the cross-beam of the thread-holding frame, which guide serves to separate the threads into tufts and hold them in position to be engaged by the nippers and severed by the shearing mechanism.

Each row of spool-holding frames is released from the chains G when the row reaches the position where it is to be engaged by the transferring mechanism by means of a series of tripping devices, represented herein as arms g^{11}, mounted on a cross rock-shaft g^{12}, which rock-shaft is operated at the proper intervals by an arm g^{13}, having a connecting-rod g^{14} leading to one arm of a rocking lever g^{15}, the other arm of which is provided with a stud or roller g^{16}, which is engaged by a cam g^{17}, carried by the drive-shaft E. The tripping-arms g^{11} referred to when rocked forwardly serve to force back the pawls g^{10} on the arms g^7, and thus release them from the chains G.

The transferring mechanism above referred to comprises a rock-shaft H, having a series of connected arms h keyed thereto, these arms varying in number according to the number of spool-frames, and usually there is one more arm than there are spool-frames. Each of these arms is provided with an adjustable plate h', having a notch or socket h^2 for receiving two sides of one of the arms g^7 at a point about midway between its ends, and a spring-actuated retainer h^3, which engages a third side of each of the arms g^7, whereby the said arm is retained in its socket h^2. Each arm h is further provided with an extension h^4, having at its free end a shoulder h^{40}, (see Fig. 9,) adapted to underlie and

partially embrace the spool-holding frame. The extension h^4 has a forward and rearward adjustment, as has also the plate h'. The two arms h of the series, the arms which are located between the outer arms, are provided with a plate h', having two sockets h^2 (see Fig. 8) and two spring-actuated arms h^3, so that the said arms may engage and support the arms g^7 of two spool-holding frames. The transferring-arms h are raised at the proper intervals to receive one row of spool-carrying frames from the chains G, then lowered to bring the spools down into proximity to the fell of the cloth, where the tuft-threads may be grasped by the nippers and a portion thereof severed by the shearing mechanism, and the arms are then again raised to return the spool-carrying frames into engagement with the said chains. The means which we employ for imparting the said alternating upward and downward movements to the arms comprises a cam h^5, (see Fig. 4,) carried by the drive-shaft E, which cam engages a stud or roller h^6 on a rocking arm h^7, connected to one of the arms h by a connecting-rod h^8. Heretofore in handling spool-frames a transferring device has been made to engage each end of each frame, and to handle these frames simultaneously in such old plan would require six transferring-arms. A loom, however, such as herein described to be practical must be capable of inserting and spacing uniformly all the tufts of each row of tufts, and consequently the contiguous ends of the spool-frames must nearly or substantially touch each other. To provide for this novel position of the end of a row of spool-frames and at the same time handle them as one rigid whole, we have had to devise the peculiar arms g^7, and also have devised one arm h to engage the contiguous ends of two alined frames, said arms coöperating to engage and move simultaneously the contiguous ends of the two frames in exact unison. As all of the arms h are keyed to the rock-shaft H, the upward movement of one of the arms imparts a similar movement to all of them. The downward movement of the transferring mechanism is arrested by means of an adjusting-screw h^9, carried by a bracket h^{10}, mounted on one of the side uprights of the main frame A, which adjusting-screw is adapted to engage an arm h^{11}, projecting from the rock-shaft H.

We provide a shearing mechanism for severing the tuft-threads after their free ends have been engaged by the nippers and a portion of the threads withdrawn from the spools, which shearing mechanism is constructed and arranged as follows: A pair of side arms i project forwardly from and are keyed to a rock-shaft I, located beneath the rock-shaft H. Outer and inner movable cutting-blades i' i^2 are mounted in bearings in the free ends of the side arms i. These cutting-blades are mounted in planes at a slight angle to each other, so that when the cutting edges of the said blades are caused to overlap the straight cutting edge of the inner blade i^2 will rest upon the top of the outer blade i'. The cutting edge of the outer blade i' is of zigzag form, so as to produce a shearing cut upon the threads, thereby ensuring a clean severing of the said threads. Intermediate strengthening-arms i^3 project forwardly and have their free ends in engagement with the inner cutting-blade i^2. These arms i^3 are arched, so as not to interfere with the regular action of the heddles D.

In operating the cutting-blades the inner blade i^2 is first advanced into its foremost position and the outer cutting-blade is then drawn inwardly to the limit of its movement in that direction.

The means which we employ for operating the cutting-blades is as follows: A transverse bar i^4 is mounted to slide in suitable bearings in the arms i i^3, which bar is provided with a series of cams i^5 on its front face, which cams are fitted to engage studs or rollers i^6, carried by the cutting-blade i^2. One or more retracting-springs i^7 extend from the cutting-blade i^2 to points on one or more of the arms i^3. This spring holds the blade i^2 at the limit of its inner movement except when the blade is forced outwardly by the transverse movement of the bar i^4. This bar i^4 is provided with a rearwardly-extended cam-plate i^8, which plate is provided with an elongated groove i^9. A forwardly and backwardly movable rod i^{10} is provided with an adjustable uprising pin or lug i^{11}, which enters the groove i^9 and serves to impart the transverse movement to the bar i^4 as the rod i^{10} is moved back and forth. The outer end of this rod i^{10} is provided with an elongated slot i^{12}, within which is located a pin i^{13}, carried by the outer cutting-blade i'. The parts are so arranged that during the first portion of the rearward movements of the rod i^{10} the inner cutter-blade i^2 is moved forwardly and during the latter portion of the rearward movement of the rod i^{10} the cutting-blade i' is moved rearwardly.

The mechanism which we have shown for imparting the forward-and-backward movements to the rod i^{10} comprises a rocking lever i^{14}, pivoted to an arm i^{15}, depending from one of the side arms i. One arm of the rocking lever i^{14} is connected to the rod i^{10} and its other arm is connected to a rocking lever i^{16} by a rod i^{17}, the lever i^{16} having a stud or roller i^{18}, which is held in engagement with a cam i^{19} on the shaft E by a retracting-spring i^{20}.

The means which we employ for raising and lowering the cutting mechanism comprises a rocking lever i^{21}, connected to one of the arms i by a rod i^{22}, which lever i^{21} is provided with a stud or roller i^{23} under the control of a cam i^{24} on the drive-shaft E. When the cutting mechanism is in its lowered position ready to sever the tuft-threads, the outer cutting-blade i' rests intermediate its ends upon a plurality of adjustable arms i^{25}, hinged to rigid arms i^{26}, carried by the breast-beam

B. The adjusting-screw i^{27} serves to raise or lower the free end of the hinged arm i^{25}. The limit of the downward movement of the cutting mechanism is adjustably limited by means of an adjusting-screw i^{28}, mounted in a bracket i^{29}, carried by one of the side uprights of the main frame A, which adjusting-screw is arranged to engage an arm i^{30}, projecting from the rock-shaft I. After the limit of the downward movement of the cutting mechanism has been adjusted the arms i^{25} are adjusted so as to just touch the bottom of the outer blade, so that although the said blade may be made quite light it cannot yield when the cutting operation is being performed.

The mechanism for operating the nippers is located below the warp-threads and the nippers are normally located below the same, the jaws of the nippers being brought upward at intervals between the warp-threads into position to grasp the free ends of the tuft-threads when the spools have been brought down in proximity to the fabric. The nipper-jaws are denoted by J J′, the jaw J′ being movable toward and away from the jaw J. These jaws extend transversely across the loom, and their upper edges are cut to form teeth, which pass up between the warp-threads for engaging the tuft-threads. The jaw J is supported in the free ends of the arms j, which are pivoted on a cross-shaft j', which cross-shaft is carried by the free ends of arms j^2, keyed to a rock-shaft j^3. The jaw J′ is hinged on a cross-bar j^4, which is mounted in bearings j^5, projecting from the stationary jaw J. The jaws are held normally apart by means of a spring j^6, extending from one of the tailpieces j^7, carried by the cross-rod j^4, to a point on one of the arms j. These tailpieces j^7 are provided with studs or rollers j^8, which are adapted to be operated by cams j^9. Each of these cams in the present instance consists of two parts, the cam part proper being extensible by means of an adjusting-screw j^{10} along the other part j^{11}. There are a number of these cams and they are all keyed to a rock-shaft j^{12}, carried by the arms j of the jaw J. These cams are operated for closing the jaws at predetermined intervals by means of a cam j^{13} on the drive-shaft E, which cam engages a stud or roller j^{14}, carried by one arm of a rocking lever j^{15}, the other arm of which is connected with an arm j^{16}, keyed to the shaft j^{12} by a rod j^{17}. The nippers are swung back and forth at the required periods by means of a cam j^{18}, carried by the drive-shaft E, which cam engages a stud or roller j^{19}, carried by one arm of a rocking lever j^{20}, the other arm of which is connected to one of the arms j by a connecting-rod j^{21}.

The mechanism for raising and lowering the nippers is as follows: A pair of cams K are mounted on the drive-shaft E, each of which cams engages a stud or roller k, carried by one arm of rocking lever k', the other arm of which is connected by a rod k^2 with the free end of an arm k^3, keyed to the cross-shaft j^3. The upward and downward movements of the nippers do not interfere with the movements of the cam which operates the nipper-jaw J′ nor with the cam which swings the nippers backward and forward.

The comb for drawing the tufts snugly into position to be woven into the fabric after they have been inserted therein is constructed and arranged with its operating mechanism, as follows: The comb proper is denoted by L, and it has a plurality of downwardly-extended teeth l, which are adapted to enter the spaces between the warp-threads when the comb is lowered. This comb L is secured to the free ends of a plurality of arms l', keyed to a cross-bar l^2, carried by the free ends of a pair of arms l^3, keyed to a cross-bar l^4, mounted in suitable bearings l^5, carried by the frame. The shaft l^4 is provided with a downwardly-extended arm l^6, which is provided with a stud or roller l^7. The cross bar or shaft l^2 is provided with an arm l^8, having a stud l^9 at its free end. A vertically-reciprocating bar M extends through upper and lower brackets, the lower bracket projecting from the main frame and the upper bracket secured to the web-supporting plate B′. The slot in the upper bracket is elongated, so as to permit the upper portion of the bar to be swung rearwardly a limited distance when so desired. The upper end of this vertically-reciprocating bar M is developed into a hook m, which is held in engagement with the stud l^9 by means of a spring m', leading to the supporting-bracket for the cloth-winding roll B^2. An operating-bar N is arranged to operate the rocking arm l^6 and the vertically-reciprocating bar M for imparting to the comb L an upward, forward, downward, and rearward movement, as follows: The rear end of the operating-bar is hinged to the free end of a rocking lever n, having a stud or roller n', held in engagement with a cam n^2 on the shaft E by a spring n^3. The bar N is provided near its forward end with a pair of adjustable collars n^4 n^5, which are provided with projections adapted to alternately engage the stud l^7 on the free end of the arm l^6. These collars are so arranged that as the bar N is slid rearwardly or forwardly there is a short lost motion before they are caused to engage the stud l^7 and rock the arm l^6. The bar N is further provided with an adjustable collar n^6, which is provided with an incline n^7, arranged to alternately raise and lower the bar M, and thereby the comb L.

By reason of the hook m being held yieldingly in engagement with the stud l^9 the said hook may be swung rearwardly, thereby disengaging the said stud and permitting the comb to be swung out of the way of the cloth when so desired.

The collars n^4, n^5, and n^6 are so arranged that when the cam n^2 is rotated to cause the

bar N to slide forwardly the comb is first raised and then moved forwardly, and as the movement of the bar is reversed the comb will be first lowered and then drawn rearwardly into its original position.

The means which we employ for advancing the chains G a sufficient distance to bring the spool-holding frames in position to be successively engaged by the transferring mechanism is as follows: A ratchet-wheel O is keyed to the rotary shaft g', upon which the sprocket-wheels g are mounted. Adjacent to the ratchet-wheel O a disk o is loosely mounted, which disk is provided with a spring-actuated pawl o', arranged in position to engage the teeth of the ratchet-wheel O, so as to rotate the said ratchet-wheel when the disk is rotated in one direction, but to idly slip over the said teeth when the disk is rotated in the opposite direction. A spring o^2, leading from the main frame to the disk o, tends to return the disk to its normal position after it has been partially rotated for advancing the ratchet-wheel O, and thereby the chains G, the required distance. The disk o is partially rotated in a direction to advance the chains G by means of a rocking lever P, having a sector portion p, from which a chain p' leads to the periphery of the disk o. This rocking lever P is suitably mounted on the frame A and is provided with a second arm p^2, from which a rod p^3 leads to a rocking lever p^4. This rocking lever p^4 is provided with a stud or roller p^5, which is engaged by a cam p^7, mounted on the drive-shaft E.

When it is desired to work the design in reversed order, we have provided the following means for reversing the movement of the chains—as, for instance, when the threads upon the last spool of the series have been used: A disk Q is loosely mounted upon the shaft g' upon the opposite side of the ratchet-wheel O from the disk o. This disk Q is connected with the arm p of the lever P by means of a chain q, and a spring q' leads from the main frame A to the disk Q, tending to return the disk to its normal position after it has been operated by the lever P. The disk Q is provided with a spring-actuated pawl q^2, which is adapted to be engaged with and disengaged from the teeth of the ratchet-wheel O. The spring o^3 of the pawl o' and the spring q^3 of the pawl q^2 are so arranged that they will hold the pawls either in or out of engagement with the ratchet-wheel O. When the pawl o' is held in engagement with the ratchet-wheel O, the chain is moved in one direction as the lever P is operated and when the pawl q^2 is held in engagement with the ratchet-wheel O the chain is moved in the opposite direction. The pawls o' and q^2 are preferably provided with thumb-pieces projecting out beyond the peripheries of the disks o and Q, so that the said pawls may be readily operated by hand.

The means employed for bringing up the weft-threads into close proximity to the tufts when the weft-threads have been led across the shed by the shuttle, so that the reed upon the lay-beam may engage the thread at all points and beat it up, is as follows: A rock-shaft R extends across the loom, and it is mounted in suitable bearings. This rock-shaft is provided at its ends with arms r r', which arms when swung forwardly are fitted to engage the weft-thread and draw it up into proximity to the completed fabric. The said arms when swung rearwardly are down out of the way of the warp and weft threads.

The means which we employ for swinging the arms r r' comprises an arm r^2, keyed to the cross-shaft R, the free end of which arm is connected by a rod r^3 to one arm of a rocking lever r^4, the other arm of which is provided with a stud or roller r^5. This stud or roller r^5 is held in engagement with a cam r^6, mounted on the operating-shaft E, by means of a retracting-spring r^7. These arms r r' do not interfere with the lay-beam F, and their forward and backward movements are so timed relative to the movements of the lay-beam that the said arms are caused to positively bring the weft-thread into position to be engaged by the reed or comb attached to the lay-beam as the lay-beam swings forwardly.

In our improved loom the nippers insert the tufts around the weft-thread and are operated from below the warps, the said nippers being projected upwardly between the warp-threads to grasp the ends of the yarns upon the spools, which are brought down to a convenient position just above the fell of the cloth from the chains by the transferring mechanism. The ends of these tuft-threads project but very little below the guides g^{11*}, and they are held accurately in position, so that the nippers are caused to grasp all of the ends evenly and firmly. When the nippers have closed upon the ends of the tuft-threads, an upward movement of the spools draws off the required length for the tufts, which are then severed by the cutting mechanism. The nippers are then caused to move downwardly until one-half of the length of the severed tufts is held below the warps close to the fell, with the other half extending above. A shot of weft is then thrown in and beaten up. The nippers are then caused to move upwardly, thereby carrying the ends, which they hold up around the said weft-thread. The nippers are then caused to release the tuft-threads as soon as they are carried to the proper height. After releasing the tuft-threads the nippers continue their upward movement until the ends are straightened. The comb L, which is mounted just above the fabric and near the fell, with its teeth projecting downwardly, is caused to move forwardly over the tops of the nippers and is then dropped upon the warp outside of the nippers, with the teeth in the comb projecting between the warp-threads. The comb is then drawn rearwardly against the nippers, and as the nippers are drawn down out of the

way the comb presses against the upturned ends of the tufts, thereby holding them accurately in position and preventing them from spreading and mixing with each other. The comb is held in this position until another shot of weft is inserted and beaten up. As the lay-beam is swung forwardly the nippers are pressed back under the fell and are caused to remain there until required to repeat their movements hereinbefore described. The nippers so constructed and operated insure the greatest accuracy in these movements, so that the surface of the fabric is almost perfect as it comes from the loom, thereby reducing the loss by shearing and finishing to a minimum.

The comb as constructed and operated serves other useful purposes besides keeping the ends of the tufts in position. It serves in lieu of templets to keep the fabric out to its full width, and it also keeps the groups of warp-threads separated, so as to give a passage for the nippers as they rise through the warp to take the ends of the yarns. The comb may also be raised by hand and swung out of the way for convenience in inspecting the work or mending the threads.

By constructing, mounting, and operating the spool-carrying frames in the manner hereinbefore described the loom is rendered capable of weaving carpets of any desired width in a simple and effective manner.

It has been found very difficult to weave tufted fabrics of this character over a yard in width for a great many reasons. Some of these reasons are that it is necessary that the bars of the spool-frames to which the tuft-guides are attached shall be kept perfectly straight and that they shall not be liable to spring out of line, but shall present the ends of the tuft-threads projecting from the guides in an even and uniform row. At the same time these bars must be light enough to be handled by the operatives, (chiefly women and young girls,) who have to remove the spools from the frames when the spools are empty and put in full spools and insert the ends of the tuft-threads into the guides ready to be attached to the carrying-chains. In our structure of loom very wide fabric may be woven with very little increase in weight or bulk per foot of increase in width in the loom.

By providing a greater or less number of pairs of chains we may employ and present in proper position any desired number of spools in an alined row and we may keep the frames of light weight, we using only one bottom bar, the employment of the old form of one-bar frame enabling the weight of the frame to be kept at the minimum. These frames when brought to their proper position hold the short projecting ends of the whole row of tuft-threads more evenly in position than it is possible to do in the old way used in narrow looms, in which the projecting ends are left long enough to form a row of tufts and are always more or less scattered and disordered.

The use of pairs of chains for each section of the spool-holding frames and the use of a single device for detaching from the chains all of the sections in one row at once renders it feasible to form very wide fabric. Heretofore in looms employing one pair of chains to carry a series of frames each having a single spool provided with a series of tuft-yarns the parallel chains of the pair have been placed at a distance apart greater than the length of the spool. The arms extended from the spool-frames and engaging the links of the chains have always been extended from the ends of the separate spool-frames, and the guides or devices through which the tuft-yarns are led and presented to the warp have always terminated on the frame within a line, cutting the spool and frame at right angles to their length just inside of the head of the spool. Feeling that light-weight spool-frames could be carried with great accuracy by pairs of chains and being desirous, therefore, of utilizing such method of moving a series of spool-frames alined in a row, we have after considerable study been able to utilize a plurality of pairs of chains to present a row of alined spool-frames and spools in such manner that a long row of tufts might be inserted at one operation and said tufts be properly and uniformly spaced. To do this, we ascertained by experiment that the old pairs of chains should be brought closer together, so that the two chains of each pair should be separated one from the other for a distance less than the length of the spool carried by the frame, and that the arms g^7, carried by and extended from the frame to engage the chains, must be extended from the sides of the frames rather than from their ends, and that the plates $g^{11\times}$ or equivalent thread-guiding means having eyes for the tuft-yarns should be practically continuous at one side of the plurality of alined frames throughout the entire length of the row of frames used, and consequently we have arranged these guides or eyes substantially to the ends of the frames, so that the eyes receiving the guides are enabled to space equally apart all the tuft-yarns to be used in the formation of a long row of tufts.

The method of constructing, supporting, and operating the shears by which the tufts are cut from the body of the yarns on the spools is especially valuable in connection with looms for weaving wide fabrics by reason of its obviating the necessity of great proportional increase in the weight and bulk of the operating parts in order to give them sufficient rigidity. In looms heretofore used the arms or bars to which the shear-blades are attached are supported only at their ends. In our structure it will be seen that the blades are supported at as many points in their lengths as may be necessary to keep the blades firmly in contact at the points of cutting, although the blades themselves may be made very light. Furthermore, the raising and

lowering of the cutting mechanism substantially in unison with the raising and lowering of the spool-frame-transferring mechanism gives an unobstructed view of the warp and fabric when the cutting mechanism is raised, thereby giving the operative free access to the said warp.

There are various ways of combining the warp and weft forming the body of the fabric. Some goods are made with two shots of weft for each row of tufts, some with three shots, and some have been made with four. Any of these goods may be woven on our loom by adapting the movement of the harness, the lay, and the weft-inserting devices to the movements of the other parts of the loom without interfering in any way with the structure and arrangement of the novel portions of the said loom.

By the use of the reversing mechanism for the spool-frame-carrying chains we are enabled to reverse the movement of the chains at any time, and thereby produce a reverse pattern in the fabric when so desired.

The mechanism for engaging the weft-threads and bringing them up into close proximity to the tufts at all times insures proper beating up of the said weft-threads by the forward movements of the lay-beam.

It will be seen that the shuttle-race is stationary, and the lay-beam reed being necessarily in front of the race it is necessary that it should be swung down below the warp when the lay-beam is at the limit of its backward movement a sufficient distance to permit the weft to be carried toward the fell, so as to be in front of the reed when it is moved forward. By the arrangement which we have shown and described the arms r r' may carry the weft forward the instant the shuttle clears the warp, even before the shed begins to close. The arms being very light may have a rapid movement and a longer range of motion than the heavy lay-beam and may be swung backward and downward sufficiently far to allow the weft to pass over their ends, while at the limit of their forward movement they will rise considerably higher above the warp than the lay-beam reed. Another great advantage in this construction is the fact that the lay-beam may be swung only a very short distance, which is very desirable in view of the fact that the said beam is necessarily quite heavy where wide fabrics are being woven.

The curved guides g^3, over which the chains G are led, serve a very important function in that they permit a very long chain to be utilized by permitting the chain to be bent back upon itself for a considerable distance, the use of sprockets for this purpose not being possible because of the spool-holding frames being in the way.

A loom constructed in the manner above described is not only capable of weaving very wide fabrics, but is also capable of weaving the same in an accurate and expeditious manner. By forming the pile of fabric upon its upper surface instead of its under surface the operative is enabled to see any imperfection in the weaving or in the pattern thereof immediately after it is woven instead of at a considerable time thereafter.

It is evident that changes might be resorted to in the form and arrangement of the several parts without departing from the spirit and scope of our invention. Hence we do not wish to limit ourselves strictly to the structure herein set forth; but,

What we claim is—

1. In a loom for weaving tufted pile fabrics, a plurality of spool-carrying frames, a transferring mechanism and a plurality of spool-frame-carrying chains arranged to present a plurality of the frames in alinement for engagement by the said transferring mechanism, substantially as set forth.

2. In a loom for weaving tufted pile fabrics, a plurality of pairs of spool-frame-carrying chains, a plurality of rows of spool-carrying frames carried thereby, each row comprising a plurality of frames in alinement with each other, means for imparting a step-by-step movement to the chains and means for simultaneously removing a row of frames from the chains, substantially as set forth.

3. In a loom for weaving tufted pile fabrics, a plurality of pairs of spool-frame-carrying chains, a plurality of rows of spool-carrying frames carried thereby, each row comprising a plurality of frames in alinement with each other, means for imparting a step-by-step movement to the chains, means for simultaneously removing a row of frames from the chains, and transferring mechanism arranged to engage the frames as they are removed from the chains, substantially as set forth.

4. In a loom for weaving tufted fabric, a plurality of series of spool-carrying frames presenting rows of frames alined in a row substantially horizontal with the fell of the fabric, independent carrying means for each series of frames, and means to move said carrying means and maintain the alinement in row of said frames.

5. In a loom for weaving tufted fabric, a plurality of series of spool-carrying frames presenting rows of frames alined in a row substantially horizontal with the fell of the fabric, independent carrying means for each series of frames, means to move said carrying means and maintain the alinement in row of said frames, and means to simultaneously remove from and then return an alined row of frames to its own carrying means.

6. The combination with frame-carrying chains, of a spool-carrying frame comprising a cross-bar having bearings at its opposite ends for supporting a spool, and a second set of arms extended from the side of said bar and having their ends shaped to be connected with the said chains.

7. The combination with the frame-carrying chains, of a spool-carrying frame compris-

ing a cross-bar having arms at its opposite ends for supporting the spool and a second set of arms arranged to partially embrace the spool and to be removably secured to the frame-carrying chains, substantially as set forth.

8. In a loom for weaving tufted pile fabric, carrying-chains, a series of spool-carrying frames comprising a cross-bar having bearings at its end to support a spool, and a second set of arms extended from said frame between the ends of and shaped to partially embrace the spool, said arms having devices to embrace said chains and maintain the arms in position on said chains when the latter are being moved.

9. In a loom for weaving tufted pile fabric, a plurality of spool-frames, independent carrying means for sustaining said frames in line, and keeping them in alinement at the point where they are to be taken from their carrying means, and transferring means a portion of which is adapted to engage the adjacent ends of two of said frames, when taking them from and restoring them again to said carrying means.

10. In a loom for weaving tufted pile fabric, carrying-chains, spool-carrying frames having suitable bearings to support a spool and having arms extended from the sides of said frame to enter links of the chains, and a suitable latch mounted upon said arms and adapted to engage the links of the chain.

11. In a loom for weaving tufted pile fabrics, carrying-chains, spool-carrying frames having suitable bearings to support a spool and having arms extended from the sides of said frame to enter links of the chains, and a suitable latch mounted upon said arms and adapted to engage the links of the chain, and means at the proper times to automatically effect the disengagement of said latches for the removal of the arms of the spool-carrying frame from said chains.

12. The combination with the frame-carrying chains, of a spool-carrying frame having arms uprising therefrom, lugs on the arms in position to enter the chain-links, spring-actuated pawls carried by the arms in position to yieldingly hold the frame on the chains and means for releasing the pawls and thereby the frame comprising a rock-shaft having tripping-arms arranged to engage the pawls and means for operating the said shaft, substantially as set forth.

13. The combination with spool-frame-carrying chains, of a row of spool-frames having arms removably engaged with the said chains and transferring mechanism comprising a plurality of arms arranged to yieldingly engage the arms on the spool-frames for simultaneously raising and lowering all of the frames, substantially as set forth.

14. The combination with one set of spool-frame-carrying chains and the frames carried thereby, of sprockets arranged to engage the inner faces of the links and a curved guide arranged to engage the outer faces of the links without interfering with the spool-carrying frames, substantially as set forth.

15. In a loom, a plurality of pairs of spool-frame-carrying chains, spool-frames mounted in said chains, and actuating means for said chains; combined with curved guides having flanges on which the spool-frames hang and over which they travel in the lower run of the chains as the frames come into their operative position, said guides supporting said chains back of the point at which the frames are taken from said chains and between said point and at a point where the chains move in substantially a horizontal run.

16. In a loom, a plurality of pairs of spool-frame-carrying chains, a row of spool-frames in alinement and mounted on said chains, said spool-frames having arms provided with horizontal lips, and said arms being adapted to be engaged with said chains, and actuating means for said chains, combined with curved guides presenting flanges on which rest the lips of the arms connected with the spool-carrying frames at their contiguous ends, whereby the meeting ends of the alined spool-carrying frames are sustained in the lower run of the chain.

17. The combination with spool-frame-carrying chains and a rotary shaft having sprockets engaged with said chains, of means for imparting a step-by-step movement of the chains, comprising a ratchet-wheel fixed to the shaft, disks loosely mounted upon the shaft upon opposite sides of the ratchet-wheel, spring-actuated pawls carried by the disks, means for partially rotating the disks in opposite directions and means for causing one or the other of the said pawls to engage the ratchet-wheel for imparting to the ratchet-wheel and thereby the chain a movement forwardly or backwardly as desired, substantially as set forth.

18. The combination with spool-frame-carrying chains and a rotary shaft having sprockets engaged with said chains, of means for imparting a step-by-step movement to the chains comprising a ratchet-wheel fixed to the shaft, a disk loosely mounted on the shaft in proximity to the ratchet-wheel, a pawl carried by the disk in position to engage the ratchet-wheel, a drive-shaft, a cam thereon, a rocking lever operated by said cam, a connection between the lever and the disk for turning it in one direction and a retracting-spring engaging the disk tending to turn it in the opposite direction, substantially as set forth.

19. In a loom for weaving tufted pile fabrics, a cutting mechanism comprising a suitable support, a pair of side arms carried thereby, inner and outer cutting-blades mounted to move toward and away from each other in the said side arms, means for operating the blades and intermediate supporting-arms for the inner cutting-blade, substantially as set forth.

20. In a loom for weaving tufted pile fabrics,

a cutting mechanism comprising a rock-shaft, a pair of side arms projecting therefrom, inner and outer cutting-blades mounted to move toward and away from each other between the said arms and intermediate supporting-arms carried by the loom-frame in position to support the outer cutting-blade at points intermediate its ends when the cutting mechanism is in position to cut, substantially as set forth.

21. In a loom for weaving tufted pile fabrics, a cutting mechanism comprising a rock-shaft, a pair of side arms projecting therefrom, inner and outer cutting-blades mounted to move toward and away from each other between the said arms, and intermediate adjustable supporting-arms carried by the loom-frame in position to support the outer cutting-blade intermediate its ends when the cutting mechanism is in position to cut, substantially as set forth.

22. In a loom for weaving tufted pile fabric, a series of alined spool-carrying frames each having a spool, independent carrying means for each of said alined spool-frames, transferring means adapted to engage and remove simultaneously from said carrying means a row of alined spools that their yarns may be put into the fabric, yarn-cutting means, actuating devices to move said cutting means toward the fabric to cut yarn and form tufts, the transferring means thereafter returning the spool-carrying frames to their carrying means, the actuating devices for the cutting means then returning the cutting means into its inoperative position.

23. In a loom for weaving tufted pile fabrics, a suitable spool-carrying mechanism, a transferring mechanism arranged to bring the spools down into proximity to the fabric above the warp, a cutting mechanism, nippers arranged normally below the warp, means for moving the nippers upwardly through the warp and cause them to grasp the tuft-threads, means for moving the transferring mechanism upwardly a distance sufficient to form the required length of tufts and means for operating the cutting mechanism to sever the tufts at the required point, substantially as set forth.

24. In a loom for weaving tufted pile fabric, a row of spool-carrying frames having spools alined parallel to the fell of the fabric, carrying means for said frames, means to actuate said carrying means, means to put said spools into their operative position with relation to the warp constituting the body of the fabric, nippers arranged normally below the warp, means for imparting to said nippers an upward movement, causing them to grasp the ends of the tuft-yarns, means for severing the tuft-yarns engaged by the nippers, means for lowering the nippers to draw the lower ends of the severed tuft lengths of tuft-yarn below the warp in the lower plane of the shed, means to cause the said nippers yet holding the lower ends of the tuft-yarns to rise through the warps, release the tufts, and then rise yet farther, the ends of the nippers acting against the ends of the tufts to straighten them, means to then retract the nippers and put them in a position below the warp preparatory to inserting a weft-thread in the shed.

25. In a loom for weaving tufted pile fabric, a row of spool-carrying frames having spools alined parallel to the fell of the fabric, means to sustain the carrying means for said spool-carrying frames, means to put the said spools into their operative position with relation to the warps constituting the body of the fabric, nippers arranged normally below the warp, means for imparting to said nippers an upward movement, causing them to grasp the ends of the tuft-yarns, means for severing the tuft-yarns engaged by the nippers to form tuft lengths, means for lowering the nippers to draw the lower ends of the tuft lengths below the warp in the lower plane of the shed, means to cause the said nippers yet holding the lower ends of the tuft-yarns to rise through the warps, release the tufts, and then rise yet farther, the ends of the nippers acting against the ends of the tufts to straighten them, means to then retract the nippers and put them in a position below the warp, and a comb having teeth to enter the spaces between the warps and act against the tufts after the nippers have released the same to draw said tufts snugly into position against previously-woven row of tufts preparatory to inserting a weft in the shed.

26. In a loom for weaving tufted pile fabric, a series of spool-carrying frames alined in a row parallel with the fell of the fabric, each frame having a spool, means to carry said spool-frames, means to take an alined series of spool-frames and spools from said carrying means and put the said spools and spool-frames in proximity to the fabric, a series of nippers, and means to actuate the same that the said nippers may rise from below upwardly between the warps, and engage the series of tuft-yarns, means to sever the tuft-yarns, the actuating means for the nippers then lowering the said nippers and drawing the series of tufts held by them into the fabric into position between the warps while a shot of filling is inserted, said nippers thereafter rising again through the warps, wrapping the tuft-yarns held by them about said weft and releasing the ends of the tuft-yarns at a point above the warps, said nippers continuing to rise after releasing the ends of said tuft-yarns then made into loops to straighten out the ends of the tufts, said nippers then retiring below the warps, leaving the tufts doubled around the weft and with both ends projecting upwardly.

27. In a loom of the class described, a plurality of series of spool-carrying frames presenting rows of frames alined in rows substantially horizontal to the fell of the fabric,

independent carrying means for each series of frames, means to move said carrying means and maintain the alinement in row of said frames, means to simultaneously remove from and then return an alined row of frames to its own carrying-means, and nippers composed of opposed notched plates presenting fingers and adapted to rise from below upwardly between the body-warp threads to engage the tuft-yarns, and means to clamp said nippers together at several points in the direction of the length of their carrying-bars to thereby close the nippers positively and firmly on the tuft-yarns throughout the length of the series of tuft-yarns presented from the alined spools.

28. In a loom of the class described, nippers composed of a series of teeth, bars to which said nippers are connected, a series of arms carrying said bars, a rock-shaft carrying said arms, and a second series of teeth, a bar carrying said second series of teeth, a rocker-lever carrying said bar and a series of depending arms connected with said rocker-lever, combined with a series of cams operating upon studs of said depending arms, and means to move said cams to force the second series of teeth toward the series of teeth first mentioned to grasp the tuft-yarn between them.

29. In a loom of the class described, a rock-shaft, a series of arms carried thereby, longitudinal bars mounted on said arms, and a series of teeth, as J, connected with said bars, a rocker-lever having a series of depending arms provided with studs, a bar carried by said rocker-lever and having a second series of teeth J′, combined with a series of cams engaging the studs of said depending arms, means to move said cams to force the teeth J′ toward the teeth J to grasp the tuft-yarns between them, and means to raise and lower said rock-shaft and swing the bar carrying the teeth J to and fro, whereby said nippers may rise and fall and also move to and fro between the warps forming the body of the fabric.

30. In a loom for weaving tufted pile fabrics, the combination with means for inserting the tufts into the fabric, of a comb, a rocking lever for imparting to the comb its forward and backward movements, a vertically-reciprocating bar for imparting the upward and downward movements to the comb, and means for operating the rocking lever and bar and means for disengaging the bar from the comb for permitting the comb to be swung away from the face of the fabric, when desired, substantially as set forth.

31. In a loom for weaving tufted pile fabric, a series of tuft-yarn frames each having a spool to carry a series of tuft-yarns, said frames and spools being alined in a row across the warp, and a pair of chains for each frame of the alined row, the chains of each pair being distanced one from the other less than the length of the spools carried by the frames.

32. A spool-carrying frame having a spool, a pair of chains separated for a distance less than the length of the spool, and arms extended from said frame and engaging said chains.

33. A spool-carrying frame having a spool, a pair of chains separated for a distance less than the length of the spool, and arms extended from said frame and engaging said chains, said arms having horizontally-extended lips, and a suitable guide on which said lips hang to sustain the frames in the lower run of the chain.

34. A plurality of pairs of spool-frame-carrying chains, a plurality of series of spool-carrying frames, one series for each pair of chains, the frames of said chains being alined transversely to said chains, a series of tuft-yarn guides spaced substantially uniformly along the edge of each alined row of frames, and spools carried by said frames, said spools being of substantially the length of the frames and supplying their yarns to said guides.

35. Spool-frame-carrying means, a plurality of series of spool-carrying frames the individual frames of each series of frames being in alinement with the frames of the other series, a series of spools in said frames, and a series of tuft-yarn guides extended along one edge of said alined frames, said guides covering a portion of each edge of each frame for a distance greater than the length of each spool of each frame, whereby the yarns led from a series of alined spools may be uniformly spaced for the production of one transverse line of tufts in the broad fabric to be made.

36. A series of pairs of chains, a series of frames carried by each pair of chains, each frame having a spool, the chains of each pair being separated one from its fellow for a distance less than the length of the spools of the frame, arms connected with the sides of said frames and crossing the axis of the spool between the heads of the spool, means to position said chains to aline in a row crossing the warp the spools of series of frames, and means to cause the said chains to be moved to place said alined rows of frames one after another in position to have their yarns utilized in the formation of a single row of properly-spaced tufts.

37. In a loom for weaving tuft pile fabric, means to cut tuft-yarns into tuft lengths, means to take said tuft lengths and bend them into loop form in the fabric, a comb, and actuating means therefor to cause said comb to descend and overlap both legs of a row of tuft-loops at that side of the row next the reed after the individual tuft-loops of a row have been set in place.

In testimony that we claim the foregoing as our invention we have signed our names, in presence of two witnesses, this 27th day of September, 1898.

HALCYON SKINNER.
FRANK H. CONNOLLY.

Witnesses:
FREDK. HAYNES,
EDWARD VIESER.